



PEGGY GREB (K11415-1)

Entomologist Philip Tipping collects samples of common salvinia at the Loxahatchee wildlife refuge in Florida.

## Tiny Weevil Beats Back Giant Salvinia

**W**hile some consider giant salvinia to be an attractive aquatic plant, this free-floating fern is also an obnoxious invader that's sometimes referred to as "the world's worst water weed."

Case in point: In ponds and lakes in sections of Texas and Louisiana, mats of *Salvinia molesta* block out sunlight and use up oxygen, making it hard for some forms of aquatic life to survive beneath them. The mats snag fishing lines and propellers, making boating, swimming, and other recreational uses impossible. The weed also clogs irrigation systems and turbines at hydroelectric plants.

Giant salvinia is notorious for its presence in slow-moving, quiet freshwater systems. Its rapid growth and tolerance to environmental stress make it an aggressive, competitive species with the capacity to take over aquatic environments, restricting water use and harming local economies dependent on recreational activities like fishing and waterfowl hunting.

But there is hope—in the form of the diminutive salvinia weevil, *Cyrtobagous salviniae*. Researchers at the ARS Invasive Plant Research Laboratory in Fort Lauderdale, Florida, have shown it to be an extremely effective biocontrol agent for giant salvinia. A mere 1/10th-inch long, the weevil causes extensive

Giant salvinia damaged by *Cyrtobagous salviniae*, a weevil whose larvae are extremely effective biocontrol agents against this water weed.

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PEGGY GREB (K11421-1)



Close-up of a weevil larva. These 1/10th-inch long insects feed voraciously on buds and rhizomes of giant salvinia.



damage to the plants. This highly specific insect feeds only on salvinia species from South America, rejecting closely related species from Africa and Europe.

Adult females lay their eggs in cavities they create by chewing into the plants' rhizomes and petioles, the structures that attach the leaves to the rhizomes. The larvae that hatch feed on buds before tunneling into the rhizomes, where the most serious damage to the plant is inflicted.

Such feeding by sufficient numbers of weevils has been shown to greatly reduce large infestations of giant salvinia and to maintain low plant population levels indefinitely, turning a dominating weed into an insignificant, usually unnoticeable, background plant.

The weevil's native range includes parts of Brazil, Bolivia, Paraguay, and northern Argentina. A second weevil population exists in Florida, where it may have been introduced as early as 1930 along with common salvinia, *Salvinia minima*, a smaller version of giant salvinia. Researchers refer to these as the Brazil and Florida populations, but they are most likely the same species, scientists say.

The first releases of the insects—in 1999 against giant salvinia in Texas—were conducted with weevils collected from common salvinia in Florida. These initial releases were not successful, because all the plots were destroyed by herbicides, floods, or droughts.

A second series of releases was started in October 2001 using weevils from the Brazil population at four sites in Texas and Louisiana. Scientists at the ARS Australian Biological Control Laboratory in Indooroopilly, near Brisbane, led by laboratory director John A. Goolsby, field-collected and shipped the Brazil weevils to Fort Lauderdale for colonization and eventual release.

Regular visits to these four sites—and to control sites where no weevils were released—have shown a steady, sometimes spectacular, reduction in giant salvinia, says Philip W. Tipping, an entomologist with the Fort Lauderdale lab. By September 2003, giant salvinia covered just 1 percent of the water's surface at sites where weevils were released, but it covered 100 percent of the surface at the control sites.

Biomass declined from more than 100 tons of fresh weight salvinia per acre at some sites to less than 2 tons during the same period. At two sites, one each in Texas and Louisiana, the mats of giant salvinia have almost completely collapsed. These water bodies formerly choked with the weed are now mostly open water.

"Results have been nothing less than spectacular," says Ted D. Center, research leader for the Fort Lauderdale lab. "It's just simply amazing how effective the weevils have been in eliminating giant salvinia."

### But Can They Handle Common Salvinia?

During the early stages of colonization, common salvinia shows exponential growth rates similar to those of giant salvinia. It typically occurs in dense, expansive populations in

both Texas and Louisiana and is becoming a big problem in the region.

An 8-year study at the Jean Lafitte National Historic Park and Preserve near New Orleans, Louisiana, showed complete displacement of native duckweed, or *Lemnaceae* species, by common salvinia. High protein content makes duckweed an important food source for waterfowl.

Tipping and his research group have started a project on the common salvinia infesting the preserve by releasing and evaluating the effectiveness of weevils from the Florida population. They have made regular recoveries of weevils, indicating that a viable population is now present in the park. While it is too early to tell, indications are that the weevils will be able to suppress common salvinia in Louisiana like they do in Florida.

PEGGY GREB (K11418-1)



Giant salvinia grows so thick it forms mats that block out sunlight and use up oxygen in lakes and ponds. Here, in a greenhouse, Student Conservation Association intern Melissa Martin and entomologist Philip Tipping record giant salvinia biomass.

The research group will continue to check the insects' progress against both weeds throughout 2004 and make releases of weevils on new salvinia infestations in Texas and Louisiana.—By **Alfredo Flores**, ARS.

This research is part of Crop Protection and Quarantine (#304) and Water Quality and Management (#201), two ARS National Programs described on the World Wide Web at [www.nps.ars.usda.gov](http://www.nps.ars.usda.gov).

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